User's Manual

The Scanning Workbench

By BRIT Systems, Inc.

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BRIT Systems

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The Scanning Workbench v7.0.1.1 User's Manual

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Chapter 1. Introduction

Book Organization

Welcome to *The Scanning Workbench User's Guide*. The first three chapters present generic information about the operation of the equipment and the software. The following three chapters are devoted to the operation of specific equipment. Chapter 7 covers the option of scanning paper documents instead of film. Sections of the book are presented as follows:

- *Chapter 1: Introduction* – Gives overview of the equipment covered; describes book organization, usage conventions, and special symbols; presents information about BRIT's Customer Support Group.
- *Chapter 2*: *General Steps and Selecting Patients* – gives overview of all steps needed to scan films and save the images to the archive; tells how to start the BRITCR application; describes how to select a patient, exam, and series for scanning.
- *Chapter 3*: *Quality Control of the Images* – Discusses how to manipulate, reprocess, and save the images after a successful scanning operation.
- *Chapter 4*: *Using the Kodak LS Series of Film Digitizers* – Describes specific steps for using the LS40, LS50, and LS75 film digitizers with The Scanning Workbench.
- *Chapter 5*: *Using the VIDAR Film Digitizer* – Describes specific steps for using the VIDAR DiagnosticPRO Advantage film digitizer with The Scanning Workbench.
- *Chapter 6*: *Using the Kodak ACR-2000* – Describes specific steps for using the Kodak ACR-2000 tabletop computed radiography (CR) system with The Scanning Workbench.
- *Chapter 7*: *The Paper Scanning Option* – Describes how to use The Scanning Workbench software when connected to a paper scanner.
- *Glossary of Related Terms*
- *Index.*

Equipment Covered in this Manual

The LS40, LS50, and LS75 models belong to Kodak's family of laser-driven, self-calibrating film digitizers that range from a low-volume model (LS40) with 2K

resolution to a high-volume, research-grade model (LS85) with up to 5K resolution. The LS40, LS50, and LS75 models are designed especially for PACS and teleradiology applications and for film duplicating. All of these machines accept films up to 14" x 17" (35 cm x 43 cm).

The VIDAR DiagnosticPRO Advantage film digitizer is based on CCD (charge coupled device) technology. This machine, available for the first time in early 2004, uses built-in automatic digitizer calibration and provides very consistent image quality.

The Kodak ACR-2000 is the world's first tabletop computed radiography (CR) system. It can be used in a mini-PACS or filmless environment, or it may be used in conjunction with a printer to improve image quality. This system supports the latest DICOM standards, including DICOM store, print, and modality work list. For a full DICOM Conformance Statement, please visit our web site at *www.brit.com*.

The ACR-2000 for The Scanning Workbench works much the same way as a film digitizer, except that rather than digitizing film, it digitizes a reusable plate on which the image is formed. Patient and exam information is first entered using The Scanning Workbench application. Then, the plate is removed from the cassette and placed in the film feeder. Next, the film is fed through the machine, the image is digitized, and it is displayed on the monitor.

An optional QC function allows for each image to be enhanced or reoriented and then accepted or rejected. Algorithms developed by BRIT optimize the image quality. The image finally is sent via DICOM to other DICOM devices, such as a printer, an archive, or a viewer. Devices can be located on a local area network (LAN) or across a wide area network (WAN). Depending on the speed of the line, image compression may be used. The amount of compression is user selectable.

In an environment where there is a Radiology Information System (RIS) with an appropriate interface, the modality work list function on the system can be used. Modality work list provides a list of the scheduled exams at the modality so that it can be selected for processing by the technologist. This eliminates duplication of keyboard entry for patient information.

As with all of BRIT's products, we encourage your participation in improving them. Please call us at 800-230-7227 and ask to talk with sales or send a note to *sales@brit.com* with suggestions. We look forward to hearing from you.

Familiarity with Windows

The Scanning Workbench User's Manual and all other BRIT Systems, Inc. user and training guides assume that the system operators know the basic functions of a mouse and can navigate in MS-Windows or X-Windows displays. That is, users know how to highlight and select, drag and drop items, select from drop-down or pop-up menus, double click to activate options, size windows, and generally move around a typical windows environment. This document provides little guidance to MS-Windows or X-Windows navigation. If you are unfamiliar with using and navigating in

Windows, we suggest you read a book on the subject or practice on a computer with a Windows display format.

Systems Support

You can use BRIT's System Support group for any questions you may have with the application or any trouble you may be experiencing with the system. For these items, contact BRIT Systems at (800) 230-7227. Your call will be answered within an hour from 8:00 AM to 5:00 PM Central Time. For emergencies at any other time, please use our emergency phone support at (888) 722-7487. Service personnel will answer the phone. BRIT Systems is your first source of contact for any troubles you may be having with your system. We will work with you to determine if it is a hardware or software failure and then call the appropriate resource to get it fixed.

BRIT System Support
M-F 8:00 AM to 5:00 PM Central Time
(800) 230-7227

BRIT After Hours Support or for Emergencies at any time
(888) 722-7487

BRIT Email Support:
support@brit.com

Conventional Use of Terms

The Scanning Workbench User's Manual uses typeface changes to set apart information in a structured way that allows users to read and understand the documents easily. The document typeface changes used throughout this book are shown and described in the following table.

Typeface/Symbol	Meaning in Paragraph Text	Examples
italics	Used for: • Document section or software titles • Special word emphasis.	*The Scanning Workbench User's Manual . . . .* You *must* be an administrative user to perform this.
Bold and Capitalized	Denotes graphical user interface (GUI) objects and titles, such as button names, dialog box titles, menu item titles, tool names, and so on.	Select the **Markup** button (it has the pencil on it).
[Shift]	Keyboard keys are enclosed in square brackets and have a bold Times Roman font. If the keys must be pressed simultaneously, a plus sign appears in the text between the keys. If multiple keys are listed, depress them in the order shown.	. . . while holding down the **[Shift]** key. Press **[Ctrl] + [Alt] + [Backspace]** to shut down the system.
Bold fixed-width	Identifies **user input** that must be typed exactly as shown.	Type **`brit`** in all lowercase for the initial login.
`Normal fixed-width`	This format identifies computer command output, including error messages shown in this book.	You will see the message: `Loading Patient Files`.

Special Symbols

This document contains notes, cautions, warnings, timesavers (tips), reminders (prerequisites), and references (related materials) to highlight information for you, as represented by the following symbols.

Note: This symbol highlights special information that is pertinent to the primary discussion. Information contained in the note is important enough that it is set off from the regular text and called to your special attention.

Caution: This symbol means *reader be careful*. It identifies information that is critical to the operation or procedure and is necessary to prevent loss of data or equipment damage to connected network components.

Reminder: This symbol means a prerequisite exists. You need to locate some required information or perform a prerequisite procedure prior to this action.

Reference: This symbol means *extensive related information exists*. It identifies another body of information you may want to examine that directly relates to the specific topic or procedure upon which you are working.

Timesaver (Tip, or Hint): This symbol means the described action saves time. The paragraph provides a specific procedure or describes where to obtain more information that helps get your job done easier.

WARNING: This symbol means *danger*. The situation can cause injury and/or severe data loss. Before you work on the equipment, be familiar with the hazards involved with electrical circuitry and standard accident prevention procedures.

Chapter 2. General Steps and Selecting Patients

Introduction

The Scanning Workbench is a high-quality film digitization system for both PACS and teleradiology systems. The Scanning Workbench is configurable with either a laser-based digitizer or a CCD-based digitizer. Each scan creates a 2000 x 2500 pixel, 12-bit grayscale image (about 10MB of data) for a 14”x17” radiograph. Each digitization process requires about 20-25 seconds. Digitizers can be configured for low-volume scanning (single sheet feeder) or for higher volume (multi-sheet feeder with barcode scanner), allowing you to match the digitizer equipment to your clinical and volume requirements.

The Scanning Workbench also can be used with the Kodak ACR-2000 tabletop computed radiography (CR) system. Each scan of a phosphor plate image from the ACR-2000 also takes about 25 seconds. The software for the ACR-2000 is slightly different from that used with the digitizers. You can perform certain reprocessing functions with the ACR-2000 that cannot be done with the two types of digitizers.

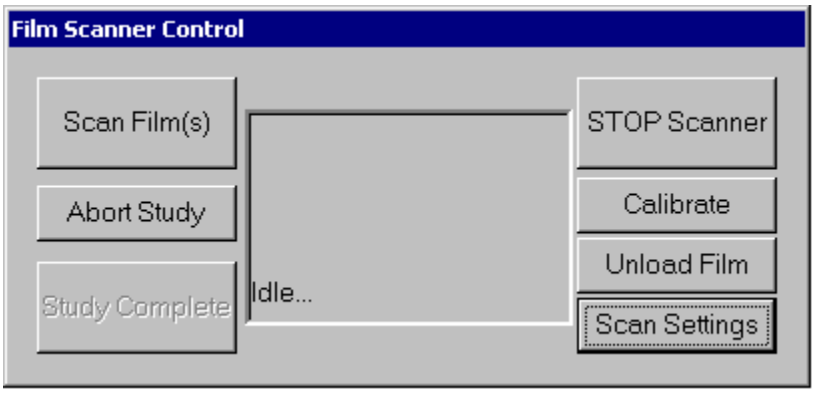
The following two subsections outline the generalized steps for the digitizing process using the Kodak and VIDAR digitizers and for the use of the ACR-2000 with The Scanning Workbench. These steps are presented before a discussion of the specific software and hardware operations to give you an idea of the overall process and data flow.

General Operating Instructions for the Digitizers

1. Load the film into the machine.
2. Perform the exam to capture the image(s).
3. Make sure the **Send Common** application is running (or start it from the icon on the Desktop). Start The Scanning Workbench application by selecting the icon labeled **BRIT Scanner** or **BRIT CR** on your Windows Desktop.
4. Select the name of the patient and then the series from the list on the screen. If the patient is not on the list, then select the **New Patient** button. If the patient is there but not the exam, then select the patient and select the **Scan/add study** button. If the series is listed, then select it first and select the **Scan/add study** button.
5. Fill out the required fields on the **Patient and Exam Information Entry** screen, if any are missing.

6. Load the film(s) in the digitizer.

7. Select the **Scan Film(s)** button from the computer screen (see following figure).

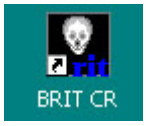


8. Listen for the machine to start and watch the film be fed into the digitizer. You will see the image appear as it gets scanned and displayed on the computer screen. Scanning takes 20-25 seconds.

9. When the image is complete, carefully look over the image. Reorient the image as necessary. If it appears to be usable, select the **Accept Image** button. If the image does not appear to be acceptable, select **Reject Image** and rescan the film.

10. Repeat steps 6-9 until all films for the exam have been digitized.

General Operating Instructions for the ACR-2000



1. For the ACR-2000, load the cassette (these are special cassettes) so that the white side of the phosphor plate faces the x-ray tube.

2. Perform the exam to capture the image(s).

3. Make sure the **Send Common** application is running (or start it from the icon on the Desktop). Start The Scanning Workbench application by selecting the icon labeled **BRITCR** on your Windows Desktop.

4. Select the name of the patient and then the series from the list on the screen. If the patient is not on the list, then select the **New Patient** button. If the patient is there but not the exam, then select the patient and select the

Scan/add study button. If the series is listed, then select it first and select the **Scan/add study** button.

5. Fill out the required fields on the **Patient and Exam Information Entry** screen, if any are missing.

6. Be sure the lights are dimmed. Take the phosphor plate out of the cassette and place it top down, bright white side in toward the machine (up against the black holder).

7. Select the **Scan Image** button from the computer screen.

8. Listen for the machine to start and watch the plate be fed into the machine. You will see the image appear as it gets scanned and displayed on the computer screen. Scanning takes 20-25 seconds.

9. When the image is complete, carefully look over the image. If it appears to be usable, select the **OK, Next Image** button. Select **Re-scan Image** if the image does not appear to be acceptable.

Note: If necessary, you can rescan a phosphor plate several times without severe degradation of the image.

10. After you have an acceptable scan, slide the plate into the eraser, white side facing back. Press the **Timer** button. Remove the plate after the timer goes off (about 1 minute).

11. Repeat steps 6-10 until all plates for the exam have been digitized and erased.

12. When all plates are done, select the **Series Completed** button on The Scanning Workbench screen.

13. The QC screen now appears (for complete details, refer to *Chapter 3. Quality Control of the Images*). The original raw data image from the first plate is displayed on the left at the same time the processed image is displayed on the right.

14. If the image looks good, select **Accept Image.** If not, then select the appropriate reprocessing algorithms (for example, sharpening). If necessary, change the image orientation using the **Flip** or **Rotate** buttons, and review the image again. Once the image is acceptable, select **Accept Image**.

15. If you cannot get acceptable image quality, select **Reject Image**.

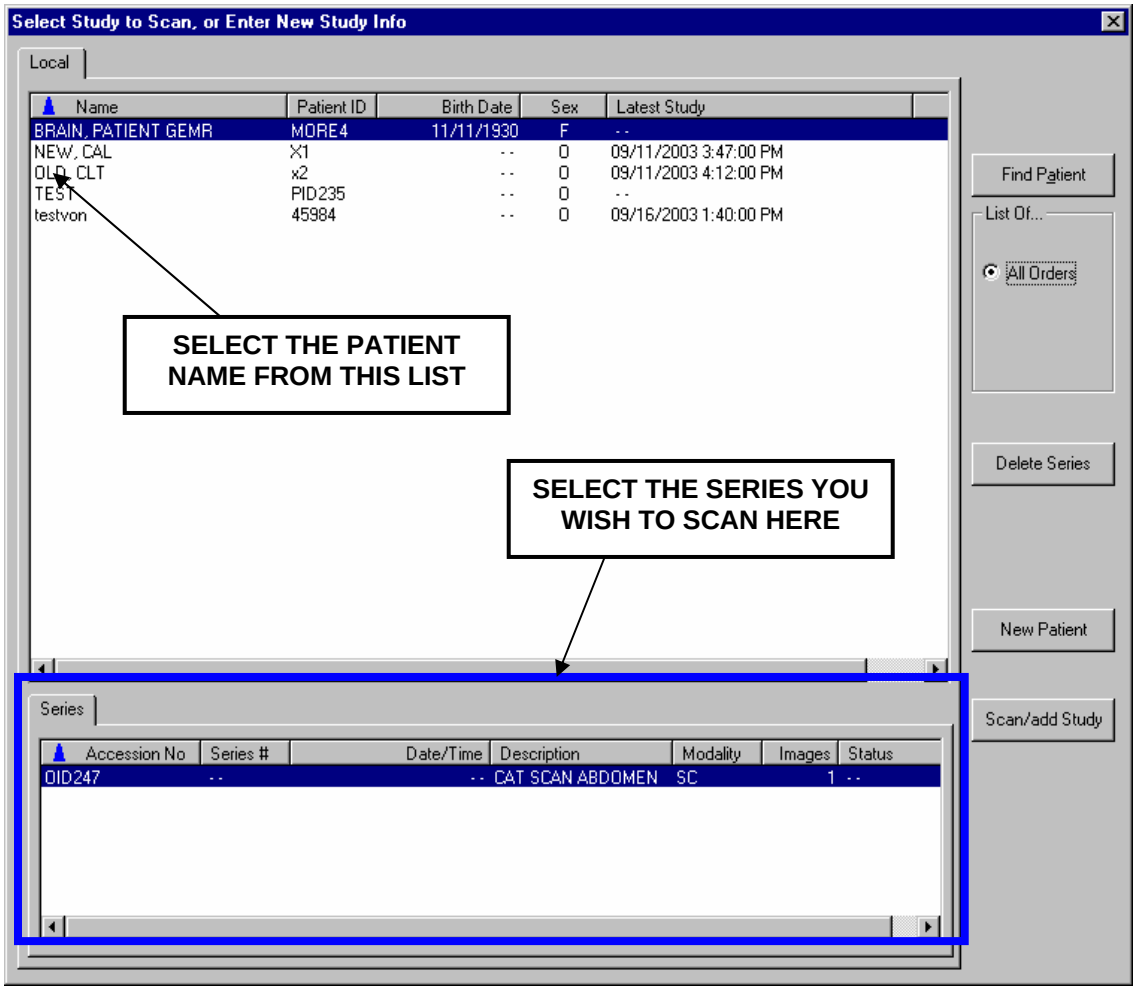
16. After an image has been accepted or rejected, the next image will be shown automatically. Repeat steps 13-15 for each image.

17. After the last image has been reviewed and accepted or rejected, the application will return to the patient selection screen.

Patient and Series Selection

Starting the Application

Start The Scanning Workbench application by double clicking the **BRITCR** icon on your MS-Windows desktop. The following **Select Study to Scan** screen will appear.



Sorting

The patient list is sorted by the field in the left-most column. To sort by **Patient ID**, **Birth Date**, or **Latest Study**, select one of these columns by placing the cursor on the column title bar and clicking once with the left mouse button. The column you click on will then move to the left-most position.

Selecting from the List

Find the patient whose exam you wish to digitize in the **Name** column, and highlight that row by selecting it. After you have selected the patient, a list of all series for that patient displays in the lower box under the tab labeled **Series**. In this lower box, highlight the series you wish to digitize and select the **Scan/add Study** button.

Selecting by Typing

You can locate the patient of interest by typing either their **Name** or **Patient ID**. If you type the patient's **Name**, the list must be sorted by name; that is **Name** must be in the left-most column. If you type the **Patient ID**, the list must be sorted by **Patient ID**; that is, ID must be in the left-most column. You do not have to move the cursor to a specific location to begin typing. As soon as you type the first letter in a last name, the cursor jumps automatically to the first person in the list whose last name begins with that letter. Additional typing limits the name to the next consecutive letter(s).

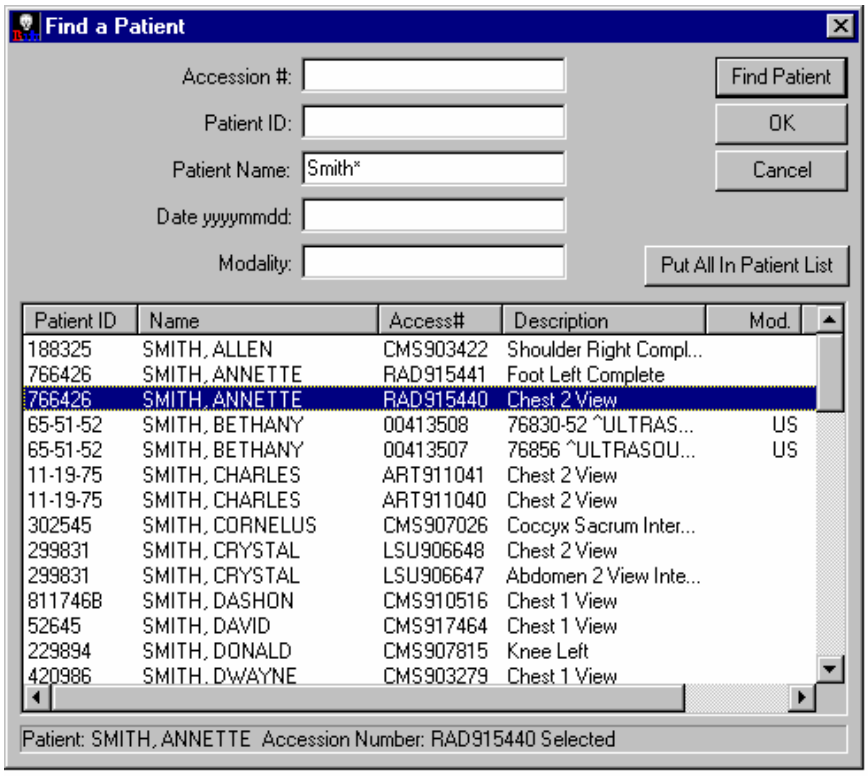
Note: Using barcode data entry to save time and prevent errors is just a variation of typing! So, if you use a barcode, make sure that the field you are barcoding is in the left-most column on the **Select Study to Scan** window.

Selecting the Series

The bottom box on the **Select Study to Scan** window contains a list of all series for the patient you select. You must select *only one series at a time* to digitize. This list can be sorted by any of the fields listed in the column title bars (headings). To sort on the list, select that column by clicking on its title bar with the left mouse button. The **Status** field under the **Series** tab has only two values: **. .** indicates that it has *not* been digitized. A value of **Verified** indicates that digitizing has been done. The series in the previous figure shows that it has *not* been digitized.

Adding a New Patient via the Modality Work List

On the **Select Study to Scan** screen, select the **Find Patient** button. The modality work list search (**Find a Patient**) window will be displayed, as shown in the following figure. The following figure has already had a search performed on the name "Smith," and therefore includes a long list of possible patients named "Smith."


Find a Patient
Accession #:
Patient ID:
Patient Name: Smith*
Date yyyymmdd:
Modality:
Find Patient
OK
Cancel
Put All In Patient List
Patient ID | Name | Access# | Description | Mod.
188325 SMITH, ALLEN CMS903422 Shoulder Right Compl...
766426 SMITH, ANNETTE RAD915441 Foot Left Complete
766426 SMITH, ANNETTE RAD915440 Chest 2 View
65-51-52 SMITH, BETHANY 00413508 76830-52 ^ULTRAS... US
65-51-52 SMITH, BETHANY 00413507 76856 ^ULTRASOU... US
11-19-75 SMITH, CHARLES ART911041 Chest 2 View
11-19-75 SMITH, CHARLES ART911040 Chest 2 View
302545 SMITH, CORNELUS CMS907026 Coccyx Sacrum Inter...
299831 SMITH, CRYSTAL LSU906648 Chest 2 View
299831 SMITH, CRYSTAL LSU906647 Abdomen 2 View Inte...
811746B SMITH, DASHON CMS910516 Chest 1 View
52645 SMITH, DAVID CMS917464 Chest 1 View
229894 SMITH, DONALD CMS907815 Knee Left
420986 SMITH, DWAYNE CMS903279 Chest 1 View
Patient: SMITH, ANNETTE Accession Number: RAD915440 Selected

The **Find a Patient** dialog allows users of The Scanning Workbench to query an institution's database to retrieve a list of the scheduled exams. The desired exam can be selected from the list for processing by the technologist. This eliminates duplication of keyboard entry. Because most institutions will have thousands of patients and exams, the scope of the query must be restricted so that a large list of results is not returned. The **Find a Patient** dialog controls the scope of the query. Note that several parameters may be used to search for patient and exam information. These parameters include:

- **Accession Number**
- **Patient ID**
- **Patient Name**
- **Date**
- **Modality.**

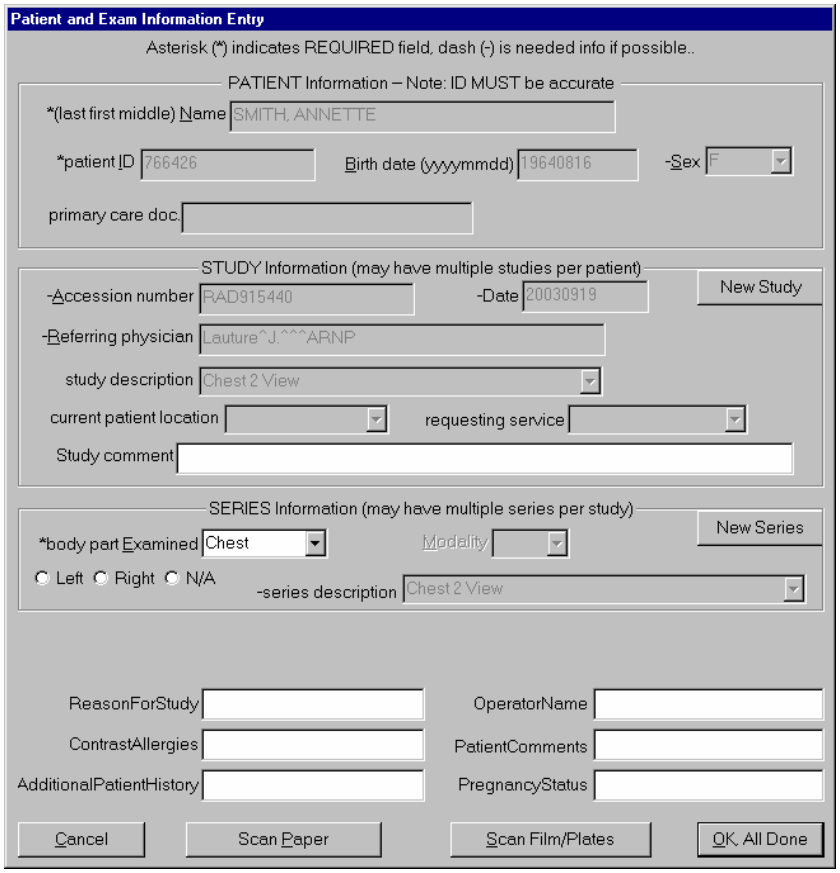
The more information that is filled in for each parameter, the more restrictive the search will be. A more restrictive search will result in a shorter list of patients and exams. A more restrictive search also will occur more quickly and use less computing resource. Generally, the more restrictive a search, the better and faster will be the results you obtain. In fact, the **Find a Patient** dialog box has been configured so that no search will occur until multiple fields have been filled in (that

is, the **Find Patient** button will be grayed out until enough information has been filled in to perform a valid search).

The wildcard characters '?' and '*' are supported when performing searches. The '?' character replaces single characters, and the '*' replaces blocks of characters. So, for example, if you want to search for all patients having a **Patient ID** ending with the characters "123" then you would type "*123" into the **Patient ID** field. Or, as shown in the previous **Find a Patient** dialog box, the search was done for all patients with a last name starting with the characters "Smith." This query returned all of the Smiths in the database (that matched all of the other search criteria). If there were a patient with the last name Smithey, then that patient also would have appeared in the resulting list. If, for example, you typed the string "10??" in the **Patient ID** field, the query result would contain all patients whose ID had four characters and started with the numbers "10." So, that query would return patient IDs like 1024, 1066, and 1067.

In general, the less specific a query is, the larger the returned list will be. Therefore, be as specific as possible when searching for patients and exams.

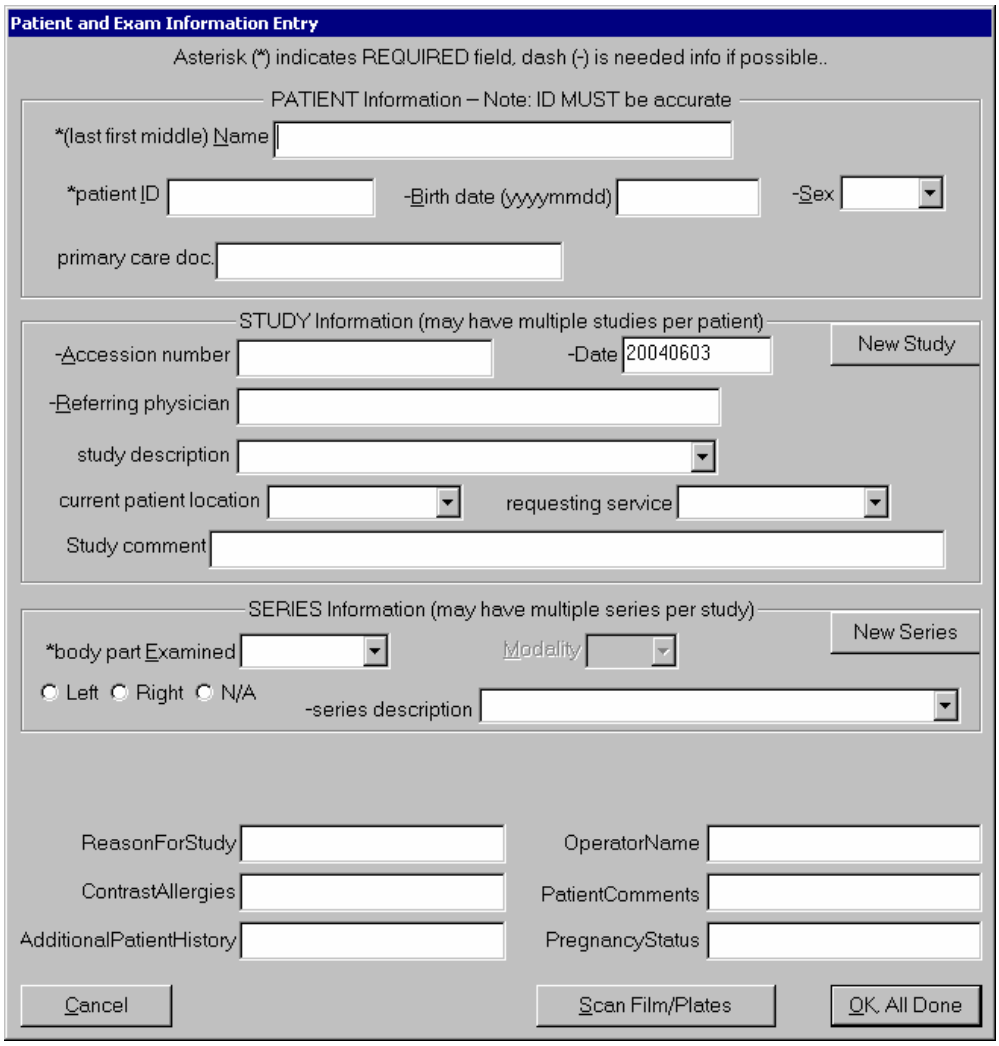
After the **Find a Patient** search has been performed and the returned list is displayed, the desired patient/exam should be selected from the list. This is done by left clicking on the appropriate item with the mouse. After an item is selected, the **OK** button becomes activated. Selecting the **OK** button displays the **Patient and Exam Information Entry** dialog box, as shown in the following figure.



If you need to change the series information, press the **New Series** button. In this case, the fields immediately below the words **SERIES Information** are cleared, and you can then type in correct information or select from the drop-down lists for **Body Part** and **Series Description**. Similarly, if you need to change the study information, press the **New Study** button. In this case, the fields immediately below the words **STUDY Information** are cleared, and you can then type in correct information or select from the drop-down lists.

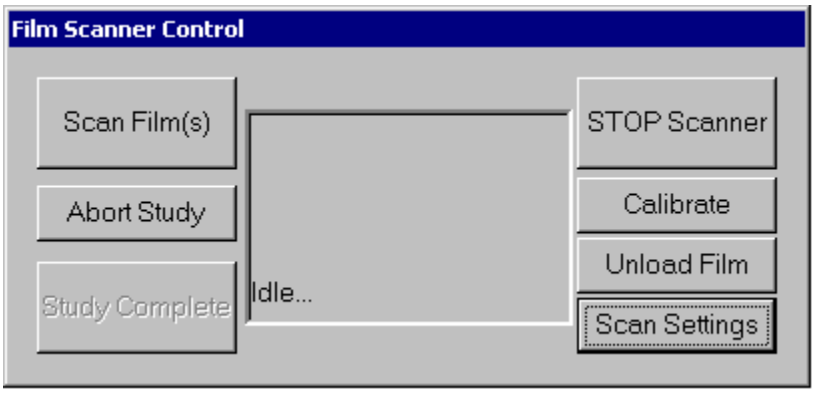
Adding a New Patient Manually

If the patient is not on the **Patient List**, add the patient by selecting the **New Patient** button on the **Patient List** screen. This displays the following blank screen.

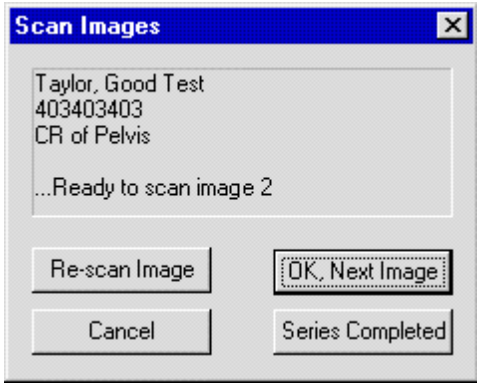


Fill in at least the required fields (**(last first middle) Name, patient ID, and body part Examined**). You will not be allowed to proceed until these fields are complete. It would be beneficial to fill in some of the other fields as well. The **OK, All Done** button saves the information, or you can go directly to scanning images for the patient and specific study by pressing the **Scan Film/Plates** button.

After you press the **Scan Film/Plates** button, different dialog boxes display depending on whether you are scanning with one of the digitizers or the ACR-2000 tabletop CR system. The following **Film Scanner Control** box displays for the digitizers.



The **Scan Images** box displays for the ACR-2000.



Adding a New Study

If the patient name is available from the list on the **Select Study to Scan** screen, but the study is not, select the **Scan/add Study** button and fill in the study and series fields on the **Patient and Exam Information Entry** screen. Be very careful when typing the **Accession number**. Using the correct number is *very important* in the tracking of the exam through the PACS. When you are done, select the **Scan Images** button at the bottom to continue.

Adding a New Series

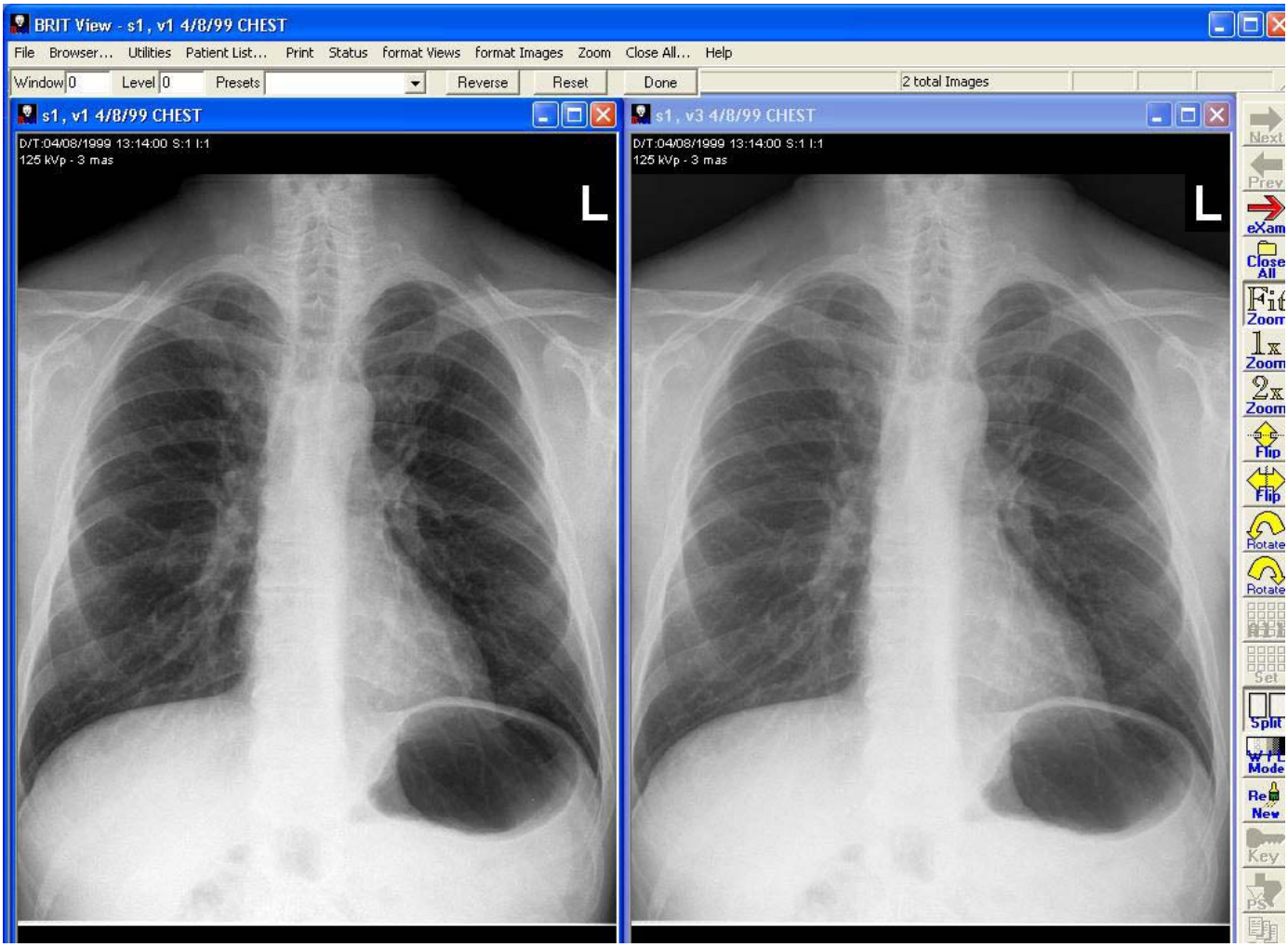
If the study is correct (and already has an **Accession number** defined), but a new series is required, just update the series information. When you are done, select the **Scan Images** button to continue.

Chapter 3. Quality Control of the Images

The Quality Control Screen

Immediately after scanning an image series on the ACR-2000, you are given the opportunity to carry out Quality Control tasks to optimize the usability of each of the images. QC tasks that you can perform after digitizing with the Kodak and VIDAR machines are much more limited than with the ACR-2000.

After you have finished digitizing the series on the ACR-2000, and you select the **Series Completed** button on the **Scan Images** dialog box, the following Quality Control screen displays.



The raw data image (unprocessed) is on the left. The image to which the default built-in processing parameters have been applied is on the right.

The Toolbar along the right-hand side of the Quality Control screen contains buttons (tools) you can use to view and reorient the image. If a button is grayed out, then that tool function is not available currently. You also will see the following small **Image Process** window, which you can move anywhere on the screen by dragging and dropping it.

During the QC work, each image in the series will be presented in the order in which it was scanned. You must accept or reject each image. Images should be rejected only after reprocessing of the image fails to produce an adequate image. Immediately after either accepting or rejecting an image, the next one is displayed.

All functions can be undone on an individual image until you select either **Reject Image** or **Accept Image**.

Image Manipulation Tools

The following tools are available to enhance the image on the screen and thus the final image sent to archive. These tools *do not permanently change the image* for saving in the archive, as do the reprocessing steps (refer to the subsection entitled *Reorienting and Reprocessing* of Image). The following tools are provided to allow you to better view the image as it is currently processed.

Window and Level

Place the cursor on the image in the tissue type area on which you wish to optimize, and click the middle mouse button. For finer adjustments, depress the middle mouse button and move it in all directions. Move the mouse away from you to narrow the range of densities being viewed on screen. Move the mouse toward you to widen the range of densities. In a similar fashion, move the mouse to the right to view the darker shades of gray available. Move the mouse to the left to view the lighter shades of gray available. Once you have the levels set to where you want them, release the mouse button. If you want to reset the values to their original value, select the **W/L Reset** button.

Viewing a Single Image on the Screen

Select the **Set** or **All** button from the Toolbar. The **Set** button acts as a toggle switch between a pre-set number of images and a single image on the screen. The **All** button acts as a toggle between a single image and all images in a series. To move between the processed and the unprocessed image, select the **Exam** button from the Toolbar.

Magnifying an Image

To magnify a whole image, click on the appropriate icon from the Toolbar. The **1X Zoom** provides you with all the information on the image, showing as much as will fit in the screen. The **2X Zoom** doubles the size of the 1X image. Zoom capabilities of 3X and 5X are available from the **Zoom** option on the main menu bar If at any time you wish to see the image covering the entire Image Viewing Area, use the **Fit** button. All of these functions work in both the single screen and split screen mode. To see portions of an image outside of the Image Viewing Area, you can use the Panning function (see next subsection).

Panning

If an image is sized so that not all of it fits on the screen, you may drag the image around the screen to bring off-screen portions of the image into the viewing area. This is called “panning” or “roaming.” To pan around an image, press on the left mouse button and hold it down. This displays a set of crossed arrows. Now, just drag the image around the screen. Move the mouse in the direction in which you want the image to move. Once the image has been panned, if you choose another image in the exam, it will be zoomed likewise. This function does not work if the whole image is displayed on the monitor.

Reorienting and Reprocessing of Images

Reorienting the Image

You can perform several types of manipulations to reorient an image so that it appears on screen as it should look when hanging on a view box. Note that these manipulations *permanently change the way the image is stored*. Reorienting of images can be done on images digitized by the Kodak and VIDAR machines and on images from the ACR-2000.

The following function icons (buttons) are available.

Rotate clockwise—this rotates the image 90 degrees clockwise each time it is selected.

Rotate counterclockwise—this rotates the image 90 degrees counterclockwise each time it is selected.

Flip right/left—this flips the image along a vertical axis (right to left) each time it is selected.

Flip up/down—this flips the image along a horizontal axis (up and down) each time it is selected.

Changing the Processing Algorithm

For the ACR-2000 only, several different sets of algorithms can be applied to the image on the right-hand side of the screen in an attempt to improve the quality. Select one of the buttons from the **Image Processing** window. If you want a better look at the processed image, you can select to view it in a single window (use the **Set** button)

The most common algorithms**: None, Default, Less Sharp, More Sharp, Noise Reduction (Reduc)** can be selected from the buttons on the **Image Process** window. Additional algorithms are selectable as pull-down items under the **Re-Process Image** button.

The **Default** button resets the processing to the one first seen in the processed window. The algorithms are not progressive; that is, selecting **Less Sharp** will always produce the same image, even if you select it multiple times. Try different buttons to see which one produces the best image.

Once the image is acceptable, select **Accept Image**. If you cannot get an acceptable image, select **Reject Image**. The next image in the series will be displayed on the screen automatically, and this process will continue until the last image from the ACR-2000 has been checked for Quality Control.

All functions can be undone until you select either **Reject Image** or **Accept Image**.

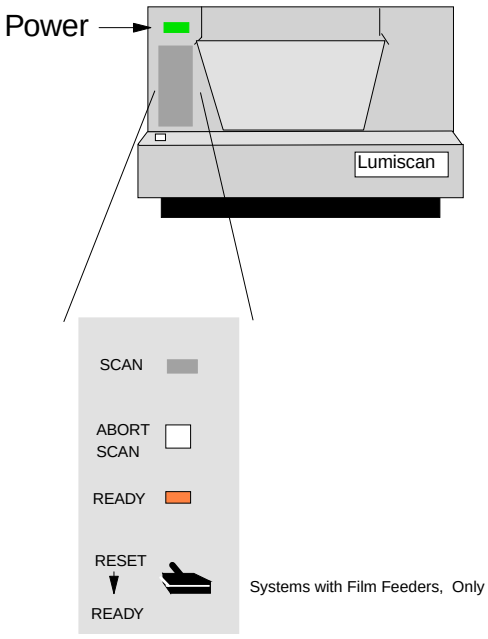
For the Kodak and VIDAR digitizers, the only buttons that display with the scanned image are shown in the following figure. You may reorient the image (flip or rotate),

but no other changes will be saved to the archive once you select **Reject Image** or **Accept Image**.

Chapter 4. Using the Kodak LS Series of Digitizers

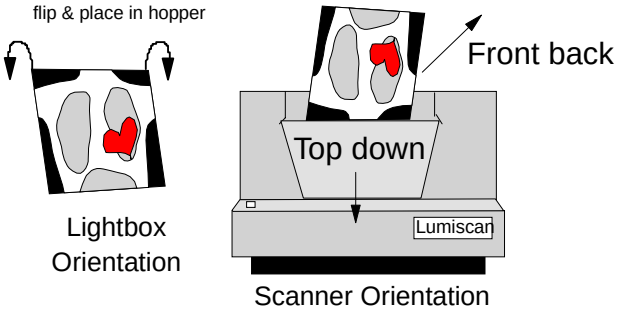
Film Loading for Digitizer Models LS40, LS50, and LS75

If you have a film feeder, be sure to depress the **Reset** lever on the front left of the Kodak (previously Lumiscan) digitizer. The **Ready** button and the **Scan** button should be green.



Place the first film in the scanner's "IN" tray. The film should be oriented so that the top of the film enters the scanner first, with the front of the film (the side of the film that would be viewed) facing back toward the scanner. If you are holding the film as you would hang it on a light box, just flip it over and place in the hopper. The diagram below shows the proper film orientation. The top of the film will stop against a guide in the scanner.

Note: While the film is actually being scanned, you must not use the computer to do anything else! It is *very* important that the digitizer not be interrupted as it writes to the computer's disk.



Film Orientation for LS Scanners

Notes and Data about the LS Digitizers

The following table gives brief descriptions of some of the major characteristics of the Kodak LS digitizers typically used with The Scanning Workbench.

Scanner Model	Scanning Rate	Resolution	Scan Sizes	Density Precision	Notes
LS40	80 lines/sec	2K	2048 pixels x 2500 lines x 12 bits (4096 gray levels)	Linear function from 0.03 to 3.2 OD	Self-calibrating; 14" by 17" film
LS50	115 lines/sec	1K	1024 pixels x 1250 lines x 12 bits (4096 gray levels)	Linear function from 0.03 to 3.6 OD	Self-calibrating; 14" by 17" film
LS75	115 lines/sec	4K	1024, 2048, or 4096 pixels x 5000 lines x 12 bits (4096 gray levels)	Linear function from 0.03 to 3.8 OD	Self-calibrating; 14" by 17" film
LS85 **(RESEARCH MACHINE)**	75 lines/sec	5K	2048, 4096, or 5120 pixels x 6140 lines x 12 bits (4096 gray levels)	Linear function from 0.03 to 3.85 OD	Self-calibrating; 10" by 12" film

LS85-LF **(RESEARCH MACHINE)**	75 lines/sec	4K	2048 pixels x 5000 lines x 12 bits (4096 gray levels)	Linear function from 0.03 to 3.85 OD	Self-calibrating; 14” by 17” film

Chapter 5. Using the VIDAR Digitizer

Film Loading for the VIDAR Digitizer

Film loading for the VIDAR digitizer is very similar to that for the Kodak LS Series of digitizers. The film must be fed top down, with the front of the film (the side viewed for normal visual reading) facing to the back of the machine. Just drop the single piece of film into the slot at the top, behind the blue plastic bar. The film will slide down a short distance, and then the machine will mechanically feed it into a starting position. See note below for multi-film feeding.

Note: If you are going to scan/digitize multiple films, place the first film as described above, and place the remaining films directly *IN FRONT OF* the blue bar on the VIDAR digitizer. Do not place more than about 20 films at one time in the feeder area.

Notes and Data about the VIDAR Digitizer

The following table briefly describes some of the characteristics of the VIDAR DiagnosticPRO Advantage film digitizer.

Parameter	Description
Clinical OD range	0 to 4.0
Outputs	32-bit mapped to 12-bit and 8-bit grayscale
Film sizes	Width: 8” to 14” ; Length: 8” to 51” ; Thickness: 0.006” to 0.008”
Auto film feeder	Standard 25-film capacity, mixed sizes, no pre-sorting necessary; light-box loading, head up, normal reading, left justified
Scan rate	200 lines/second
Illuminator	Instant-On Hot Light™ Technology; life ≥ 100,000 scans
Detector	Solid state, next generation high definition CCD (HD-CCD®)
MTBF	≥ 50,000 hours
Calibration	Automatically recalibrates the digitizer every 5 seconds for consistent image quality

Reading the Diagnostic LEDs

The three LEDs on the front center area of the digitizer provide operating information. In general, the LEDs cover the following functions:

Location	Function	Normal State
Top LED	Feeder status	Solid green
Middle LED	Digitizer status	Solid green, but slow flashing when digitizer is busy
Bottom LED	Power status	Solid green

Specific states of the three LEDS are given in the following three tables.

Top LED State (Feeder Status)	Digitizer Condition	Corrective Action
Solid green	Ready	None. The feeder is ready to operate.
Off	ERROR: no feeder attached.	1. Turn off digitizer.

		2. Remove feeder. 3. Inspect electrical connector and screws on bottom of feeder.
Fast flashing green	ERROR: unknown feeder attached.	Check feeder serial number. Only feeders having serial numbers beginning with 3 can be installed on DiagnosticPro Advantage. Check feeder: 1. Turn off digitizer. 2. Remove feeder. 3. Inspect electrical connector and screws on bottom of feeder.
Slow flashing green	BUSY: film is staging.	None. This is normal operation.
Fast flashing green.	ERROR: film staging problem.	Eject film by clicking the eject button in the scanning operation.

Middle LED State (Digitizer Status)	Digitizer Condition	Corrective Action
Solid green	Ready	None. The digitizer is ready to accept commands from the scanning operation.
Slow flashing green	BUSY: normalizing	None. This is normal operation. The LED will flash slowly during initial calibration after power is applied, and when the scanning application initiates a calibration.
Slow flashing green	BUSY: tracking (ADC)	None. This is normal operation. The LED will flash periodically when the digitizer is idle. Automatic Digitizer Calibration (ADC) is independent of the scanning operation.
Slow flashing Green	BUSY: staging film	None. This is normal operation. He LED will flash slowly while the digitizer is staging the film.
Slow flashing green	BUSY: positioning film	None. This is normal operation. The LED will flash slowly while the scanning application is positioning the film.
Slow flashing green	BUSY: digitizing film	None. This is normal operation. The LED will flash slowly while a film is

		being digitized.
Slow flashing green	BUSY: ejecting film	None. This is normal operation. The LED will flash slowly while the scanning application is ejecting the film.
Off	ERROR	1. Make certain power is applied to the digitizer, and that the digitizer power switch is on. 2. If the problem persists, get qualified technical help.

Bottom LED State (Power Status)	Digitizer Condition	Corrective Action
Solid green	Ready	None.
Fast flashing green	ERROR: DSP not communicating	Contact qualified technical help.
Fast flashing green	ERROR: unknown ballast	Contact qualified technical help.
Off	ERROR	1. Make certain power is supplied to the digitizer, and that the digitizer power switch is ON. 2. If problem persists, get qualified technical help.

Chapter 6. Using the ACR-2000 System

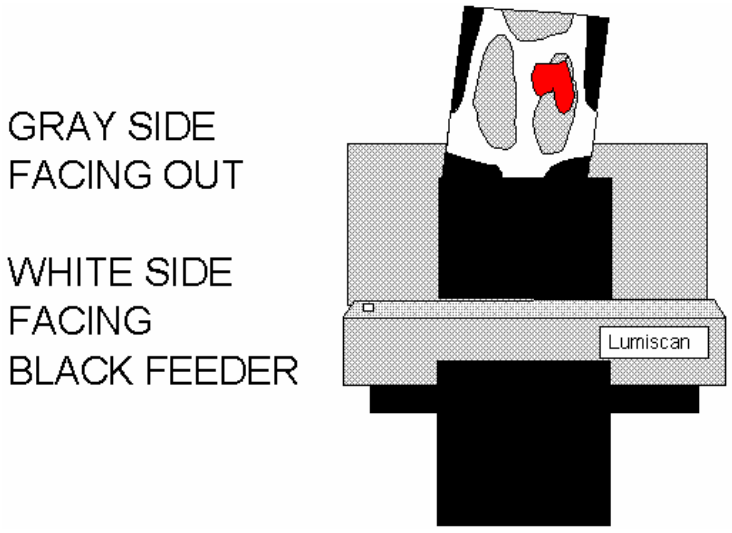
Loading Cassettes into the ACR-2000

The ACR-2000 uses different cassettes than conventional radiographs. Sometimes the conventional cassettes have just been refurbished. So, be sure to use only those cassettes designated for use with the ACR-2000.

The sides of the phosphor plate are not the same. One side is very white. The other side has a gray tint. The white side is the "active" side. Load the cassette so the white side faces the x-ray source. Otherwise, you will not get an image.

Caution: Allow the ACR-2000 to warm up for 15 minutes to stabilize the electronics prior to using. It is extremely important that the ACR-2000 be in a low light environment. There should be NO overhead fluorescent lights shining on the digitizer. This is because light can enter the scanner and create noise in the readings.

Remove the plate from the cassette and place it upside down, with the "active" side (the whiter side) facing the machine and the gray side facing out. The plate just gets placed up against the black feeder. PLEASE BE VERY CAREFUL WHEN HANDLING THE PLATES. HOLD THEM ONLY ON THE EDGE. DO NOT DROP THE PLATES!



Scanning the Images

Once the plate is in place, select the **OK, Next Image** button. You will hear the digitizer's motor start to feed the plate through the ACR-2000. The image starts appearing on the screen. If the image quality does not look good, finish the plate and then select to **Re-scan Image**. You can re-scan the plates several times without significant image degradation.

When the image looks acceptable, select **OK, Next Image**. The **Scan Images** box (shown above) will show a message when the system is ready to digitize the next plate.

When you have digitized all plates, select the **Series Completed** button.

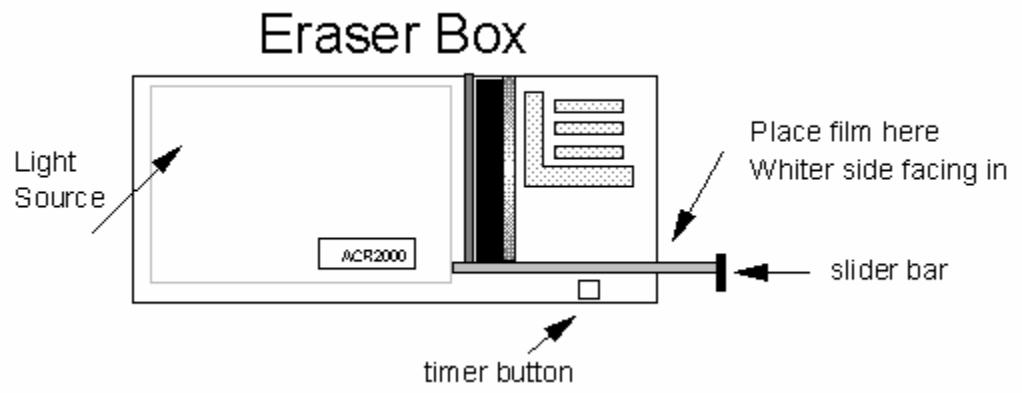
Erasing the Plates

When you are sure you will not need to re-digitize a plate, it is time to erase it. Plates can be re-digitized several times without severe image degradation.

Note: All plates should be erased daily. If not, ambient light can create noise on the plates. This can be fixed by erasing the plate just before the exam is taken.

Plates are erased by placing them in the eraser that comes with the ACR-2000. Pull out the slider bar from the bottom right-hand corner of the eraser. Place the plate on the bar with the whiter side facing the back, grayer side facing out (refer to the following drawing). This orients the plate so that the "active" side is facing the lights. Using the slider bar, slide the plate into the eraser and press the timer button under the slider. When the timer goes off, the plate has been erased. Pull the slider bar out and remove the plate.

.



Notes and Data about the ACR-2000

The following table gives brief descriptions of some of the major characteristics of the Kodak ACR-2000 tabletop CR system as used with The Scanning Workbench.

Parameter	Description
Supported phosphor plates	Up to 14” by 17”
Scan rate	50 seconds per plate
Erase time	30 seconds per plate, with separate eraser
Workstation	Minitower computer, Windows 2000 Operating System; Monitor, Keyboard, Mouse
Weight	85 lbs (38.6 kg)
Dimensions	Width: 21” ; Depth: 27”
Compression available	Lossless JPEG, Lossy JPEG, Enhanced JPEG (up to 100:1 ratio)

Note: For complete information about using the Kodak (Lumisys) ACR-2000, please refer to the *ACR-2000 Operator’s Reference Guide* (Part Number 0070-711, Rev. 01, February 12, 1999). This document contains warnings about laser safety. In general, the covers on the ACR-2000 protect users from the exposure to laser light when properly installed. If you notice any cover damage upon receipt of the machine, please contact your service representative for replacement.

Chapter 7. The Paper Scanning Option

Introduction

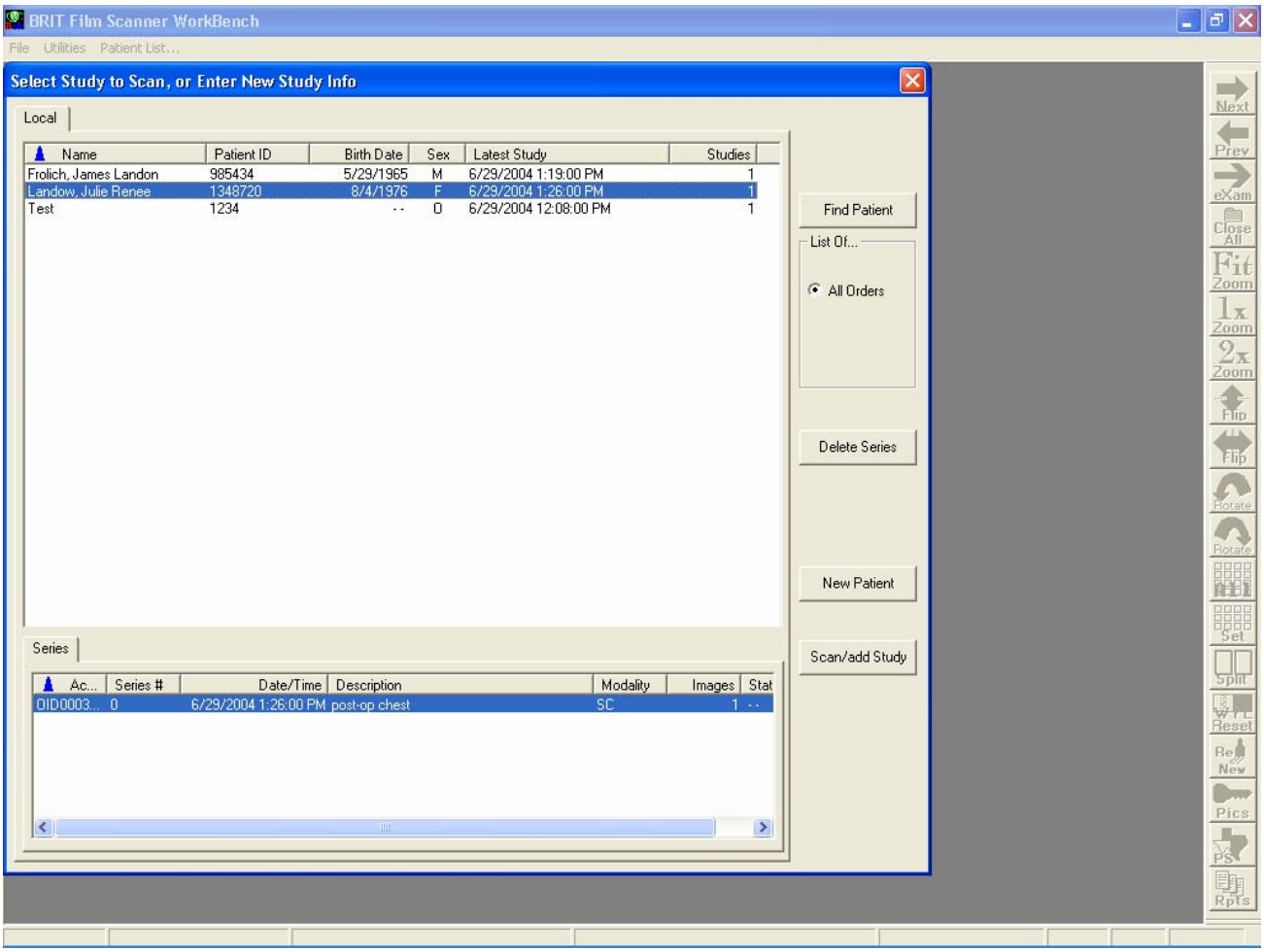
The Scanning Workbench is a high-quality digitization system that also can be connected to a paper scanner, such as a Hewlett-Packard ScanJet or Visioneer One Touch. The Scanning Workbench software recognizes the hardware to which it is attached and displays appropriate software prompts accordingly.

The following subsection outlines the generalized steps for the digitizing process using the Visioneer One Touch 8920 USB machine. The prompts you would see when connected to any other paper scanner would be identical.

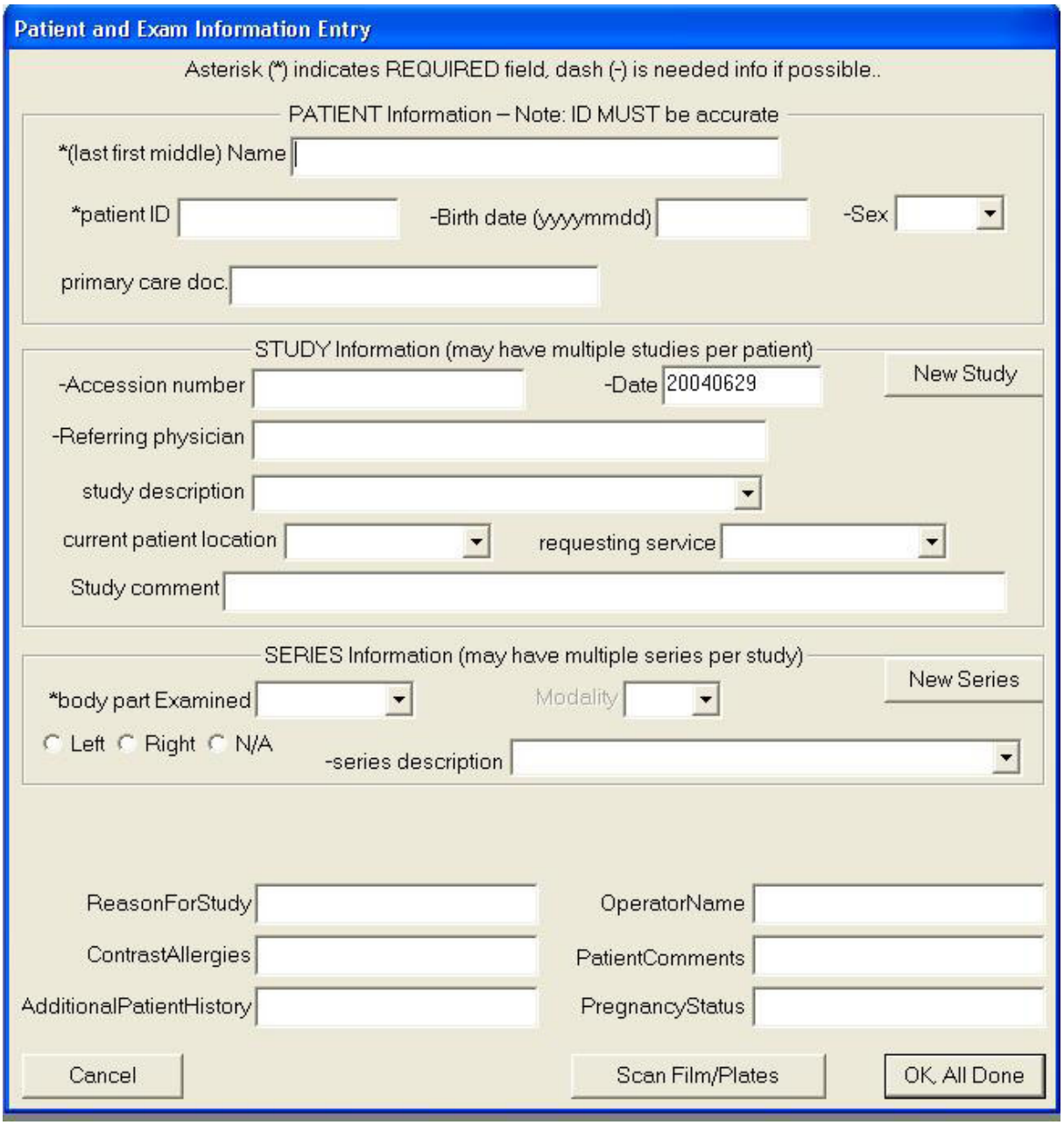
Operating Instructions for the Paper Scanner

1. Make sure the Send Common application is running (or start it from the icon on the Desktop).
2. Start The Scanning Workbench application by selecting the icon labeled BRIT Scanner or BRIT CR on your Windows Desktop.
3. Select the name of the patient and then the series from the **Select Study to Scan** box (see following figure). If the patient is not on the list, then select the **New Patient** button. If the patient is there but not an exam, then select the patient and select the **Scan/add study** button.

Note: Whether you use the scanner to scan only one page or to scan multiple image pages, you are creating a new series in the study for that patient.



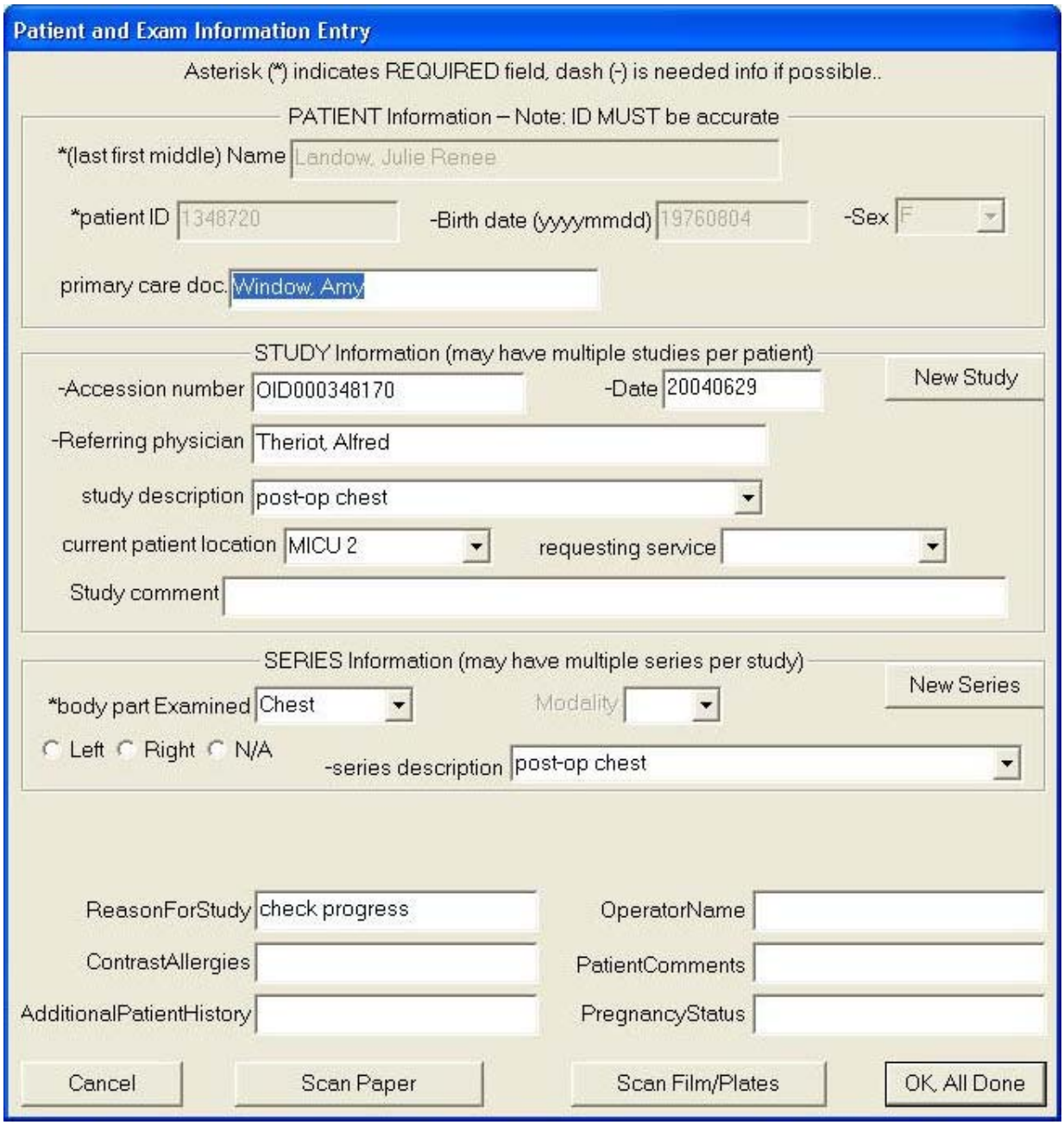
4. If you press the **New Patient** button, the following **Patient and Exam Information Entry** screen displays. Fill out the required fields on the screen. Note that you can select a patient and add a study or series using this same screen.



5. After you have finished adding the new patient, study, or series, press the bottom right-hand button labeled **OK, All Done**.

6. On the **Select Study to Scan** box, select the patient and series. In our example we are choosing Julie Landow and scanning two images.

7. Highlight the patient name in the upper box and select the **Scan/add study** button. We have highlighted the name Julie Landow. Notice that a new button now appears on the bottom left side of the **Patient and Exam Information Entry** screen (see following figure). The button is labeled **Scan Paper**.

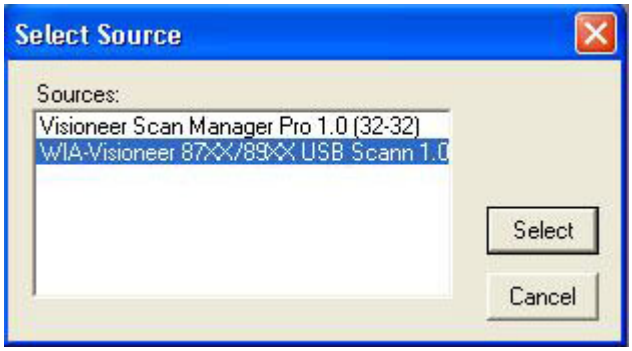


8. Place the first paper page properly in the scanner and then press the **Scan Paper** button. The **Paper Scanner Control** dialog box then appears, as shown in the next figure.

9. You may want to check the scanner settings before you scan by pressing the **Settings** button. The following **Settings for Paper Scanner** dialog box will display.

10. Adjust the size and resolution as you prefer by typing in new numbers and select **OK**.

11. If you have only a single image to scan as a new series, select the **Scan One Page** button on the **Paper Scanner Control** box. If you have multiple pages to scan as one series, select the **Scan Multi Page** button. The following **Select Source** dialog box displays.



12. The **Select Source** dialog box should display each time you start a session. Highlight the scanner to which you are attached and press the **Select** button.

13. The scanner will start and you will see the message: `Attempting to acquire image #1`.

14. You will also see the message: `Transferring data`. Scanning takes about 20-25 seconds. After scanning is complete for the first image, you will see the message: `Saved image #1`.

15. Remove the first paper image from the scanner and insert the next page (we are assuming that we are scanning multiple pages as a series, so select the **Scan Multi Page** button again).

16. You will see messages about the second image and that it has: `Saved image # 2`.

17. After you have finished scanning the series of images, press the **All Done** button on the **Paper Scanner Control** box.

18. Soon the first image will display on the computer screen, along with the controls for QC'ing the image and the **Image QC** dialog with the two options **Accept Image** and **Reject Image**.

19. Carefully look over the first image. Reorient the image as necessary. If it appears to be usable, select the **Accept Image** button. If the image does not appear to be acceptable, select **Reject Image** and rescan the paper

20. After you select **Accept Image**, the next image you scanned appears, and you must again make the decision about accepting or rejecting the image.

21. After you have accepted all images that were scanned, the screen returns to the **Select Study to Scan** screen. You can then select another patient for whom to scan images.

Glossary of Related Terms

1x Zoom

Viewing function that displays the image in its full resolution on the screen. Thus, a 1k x 1k screen would only show one quarter of a 2k x 2k image.

2x Zoom

Viewing function that doubles the resolution in each direction before displaying. Thus, a 512 x 512 image would use 1024 x 1024 pixels for display.

ACR-2000

Desktop computed radiography (CR) system from the Eastman Kodak Company (previously Lumisys).

Clicking

Quickly depressing and releasing a mouse button. A general term used in Windows systems for working with a mouse. Clicking normally is used to select an object.

Computed Radiography

Computed radiography systems are systems that digitize using phosphor-stimulated plates that have been exposed to images using normal radiographic techniques. The plates are a replacement for film, which is not reusable.

DICOM

Digital Imaging and Communications in Medicine. This is the standard that defines how medical images can be shared in a mixed-vendor environment. This client-server standard defines both the object types that it supports and the services that can be provided to those objects (such as the printing of a CT).

Dragging

Moving an object around the screen in a Windows system by depressing and holding down a mouse button while moving the mouse. Usually, the left mouse button is used. This is a general term used in Windows systems.

Eraser

The eraser is a box that comes with the ACR-2000 for erasing its phosphor plates. It contains an enclosed light source and a timer. The erasing process allows the plates to be reused many times.

Fit

Fit is a viewing function that sizes an image so that the whole image "fits" onto the screen.

Hanging Protocols

Tools that automatically display images in a predetermined format across the monitors. Hanging protocols are defined by user and by exam type.

HL-7

Hospital Language - 7; a standard interface for communicating information between dissimilar computer systems. It does not support medical images. DICOM-3 is the standard for medical image transmission.

JPEG

Standard technique for compressing images. This can be set at different levels, such as "lossless" or at some degree of loss. Ratios of 8:1 and 16:1 are popular settings.

Mini-PACS

Mini-PACS systems are systems that allow for the acquisition, transmission and viewing of medical images in support of one or several services in a hospital.

Montage

A screen with tiles of individual images arranged in rows and columns. CTs and MRs are often viewed in this mode.

PACS

Picture Archival and Communication Systems - systems that support the acquisition, transmission, archiving, and viewing of medical images.

Phosphor plate

This is a reusable plate used in CR system in place of film. The plate contains a photo-stimulated phosphor upon which an image gets created by exposure to x-rays. The image is read by the CR reader (ACR-2000 in this solution), then the plate is erased via a light source for reuse.

Raw data

This is the same as a full data set; actual size depends on the modality. It has not been compressed or trimmed; it is as it was received from the modality.

Roaming

Also called Panning. Moving around an image that is larger than the screen by dragging the image.

Toolbar

The column of buttons (and icons) used to activate different functions found on the right margin of the viewing screen.

TCP/IP

Transmission Control Protocol/Internet Protocol. The de facto standard for data communications between different computer systems. It is the communications standard used to communicate over the Internet.

Zoom

Change the magnification of the image. Zooming in refers to increasing the magnification. Zooming out refers to decreasing the magnification.

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